

# (12) UK Patent Application (19) GB (11) 2 314 213 (13) A

(43) Date of A Publication 17.12.1997

(21) Application No 9704190.9

(22) Date of Filing 28.02.1997

(30) Priority Data

(31) 9620680  
9702079

(32) 12.06.1996  
24.01.1997

(33) KR

(71) Applicant(s)

Kim Youn Kook  
231-101 Kaneung-Dong, Ouejungbu-City, Kyungki-Do,  
Republic of Korea

(72) Inventor(s)

Kim Youn Kook

(74) Agent and/or Address for Service

Venner Shipley & Co  
20 Little Britain, LONDON, EC1A 7DH,  
United Kingdom

(51) INT CL<sup>6</sup>

B62J 6/00 6/06, H01R 35/04, H02K 5/22 7/18 11/00

(52) UK CL (Edition O)

H2A AKR7 AKT5 AKX2 AK117 AK120 AK211 AK216B  
AK217B AK701 AK704 AK705 AK805 AK808  
H2E EEPER  
H2H HAJ HLV3 HLV6  
U1S S1825

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94-102397/13 & DE004231436 (FER) WPI Abstract  
Accession No 83-D1816K/10 & DE003132005A (ETZBA  
CH)

(58) Field of Search

UK CL (Edition O) H2H HAJ HLV3 HLV6  
INT CL<sup>6</sup> B62J 6/06, H02J 9/04  
ONLINE:WPI,CLAIMS,JAPIO: OPTICS(H2A)

(54) Cycle hub generator, control arrangement and condenser backup supply

(57) A cycle generator system comprises hub generator 1, stabilizer 23, and condenser 24 to supply backup power. The lamp(s) 27 are supplied via a fuse box 25 and switch 26, one power output wire going to fuse box 25 the remainder going to the stabilizer. The generator stator coils 3 are fixed relative to the axle 2 and external connection through the wheel securing nut 9 is established by first spring loaded contacts 12, contact plates 13-16, second spring loaded contacts 20, and contact plates/terminals 22,22a. Insulated elements 17,18,21 isolate the conductive path. Alternatively, a bore 37b may be provided through the bearing 36a, which communicates via a passage 38b in the spacer 38a to provide a wiring outlet.

The rotor may comprises a permanent magnet rotor or may carry coils.

FIG2

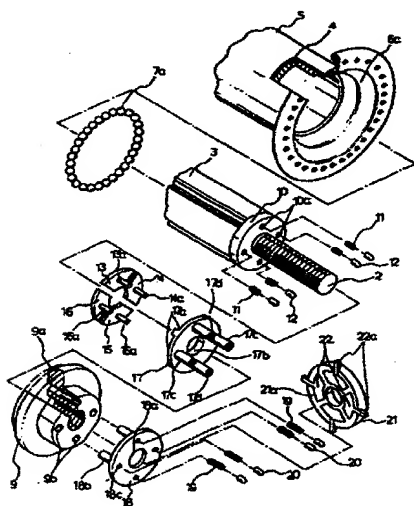


FIG3

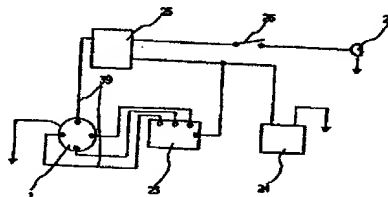
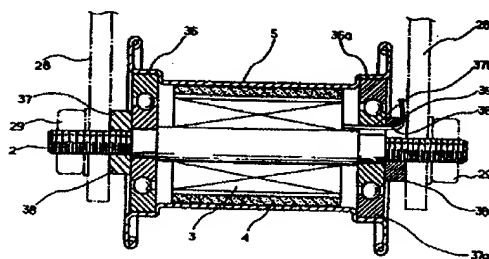


FIG4



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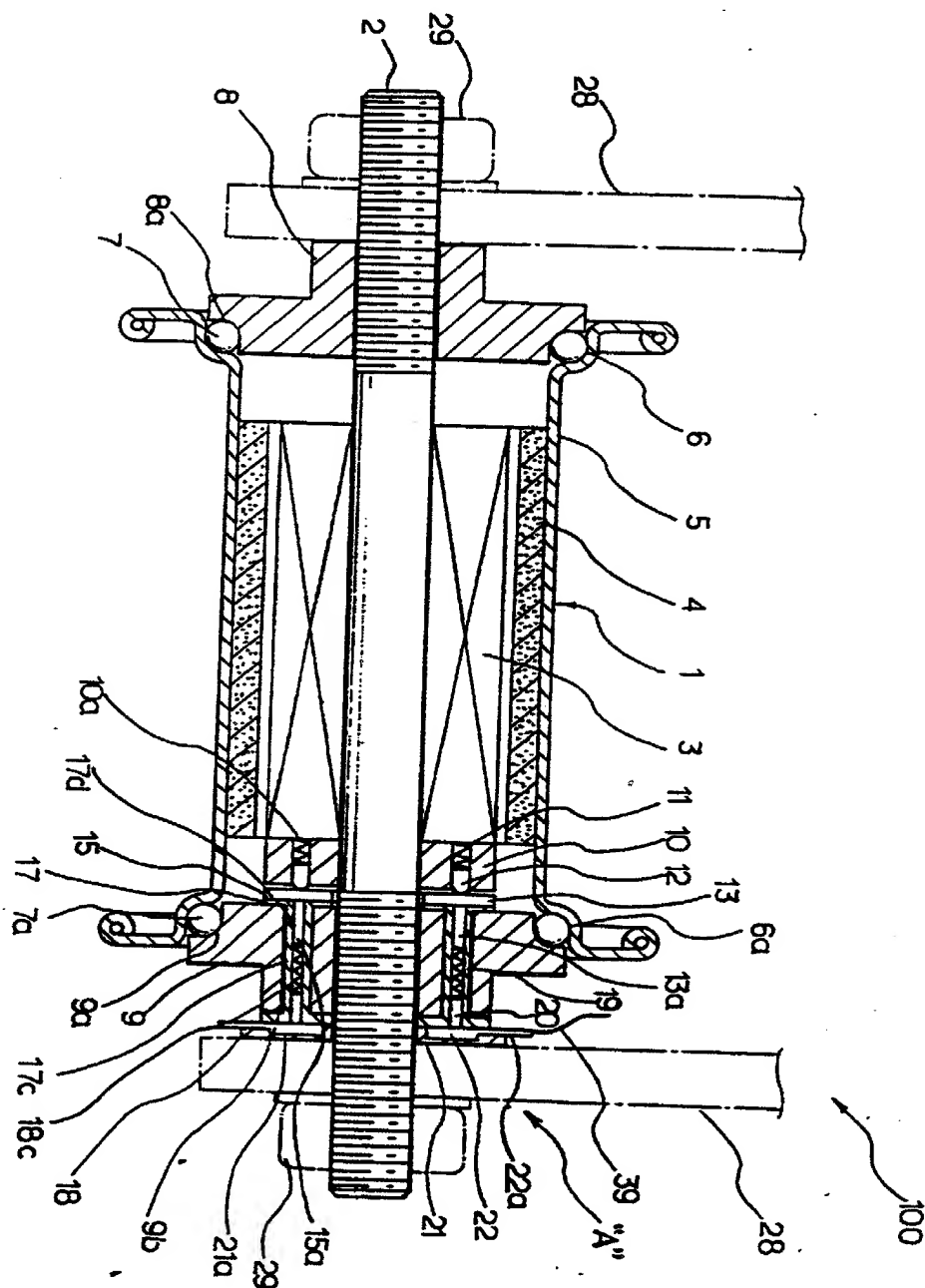


FIG.2

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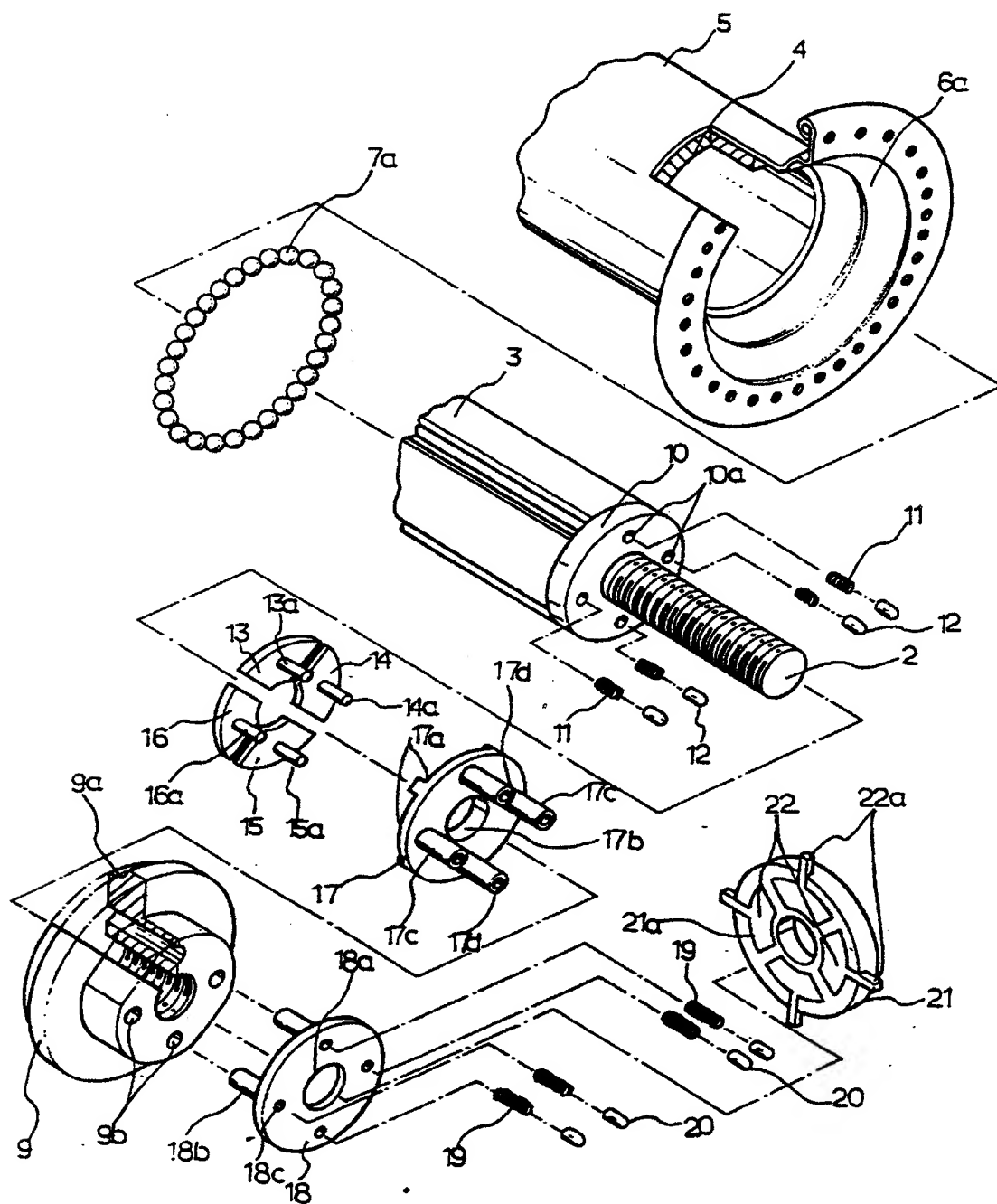
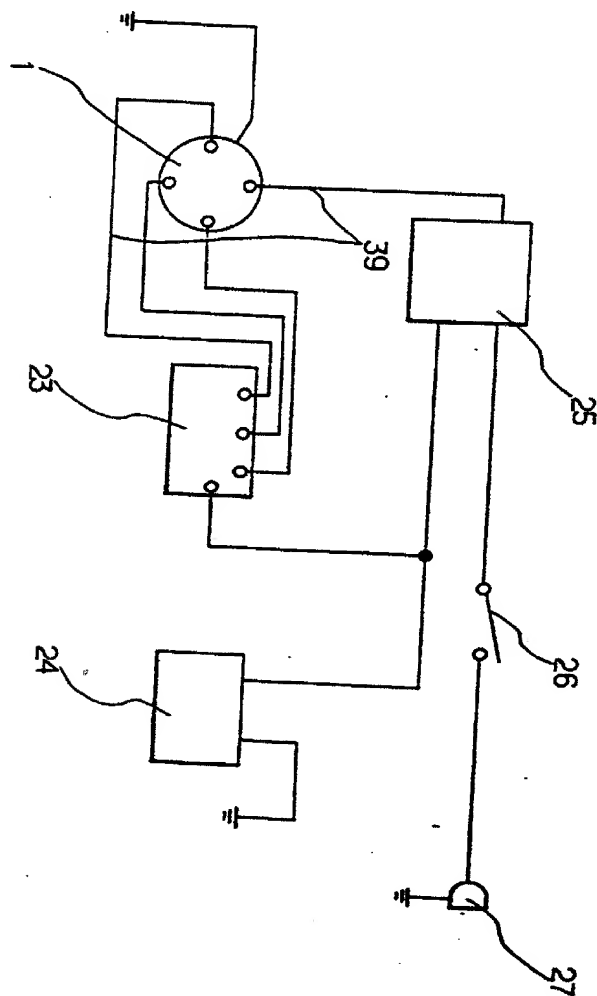


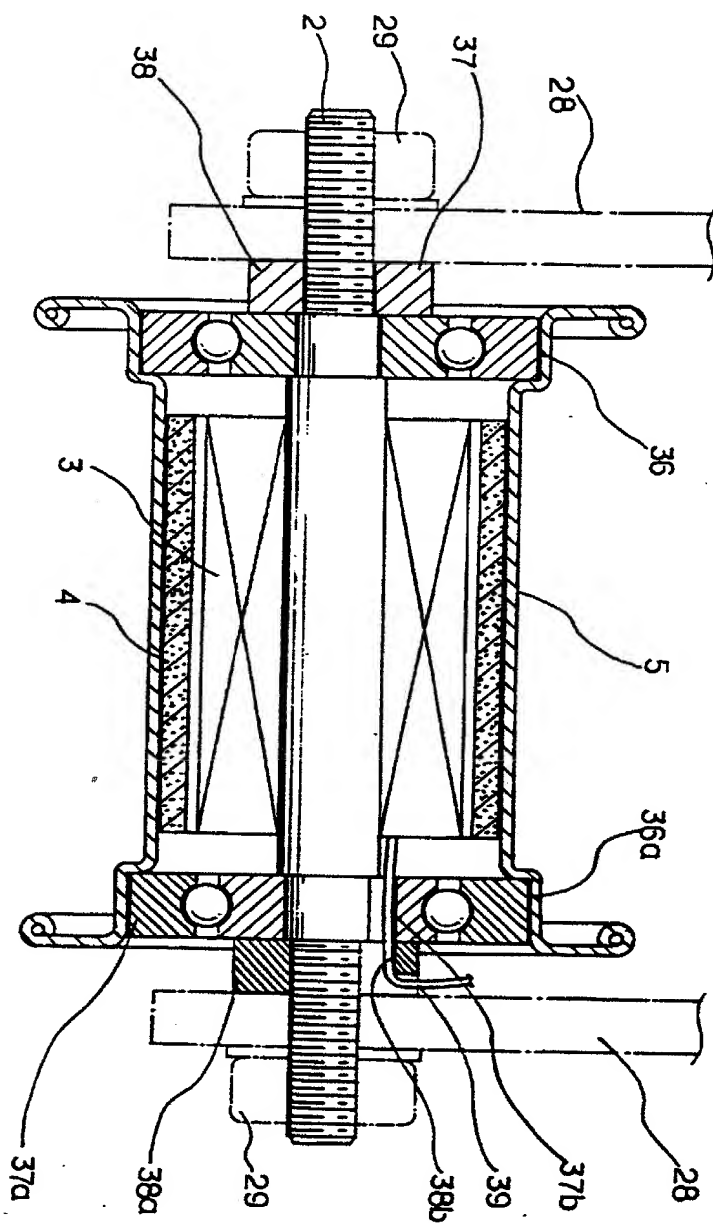
FIG.3

3/6



4/6.

FIG.4



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FIG.5

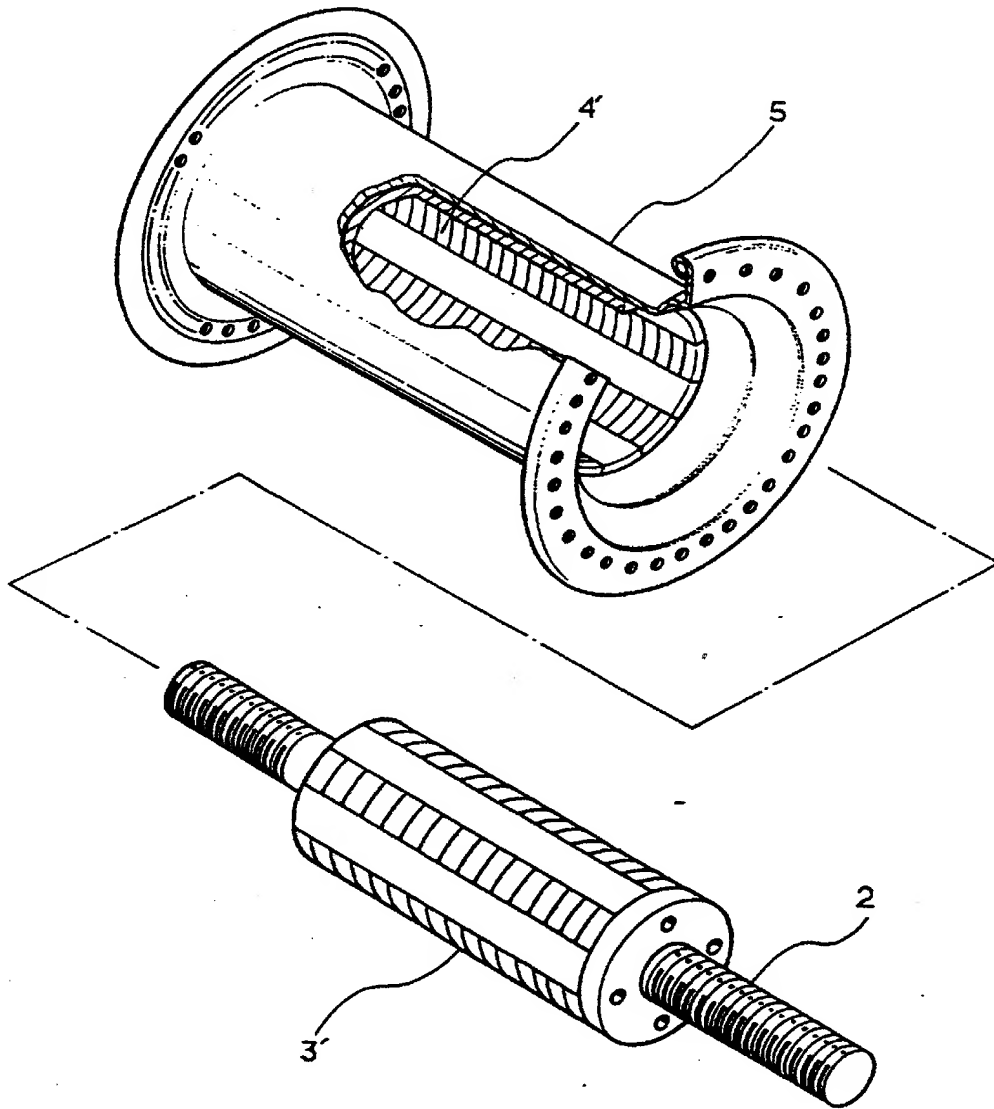
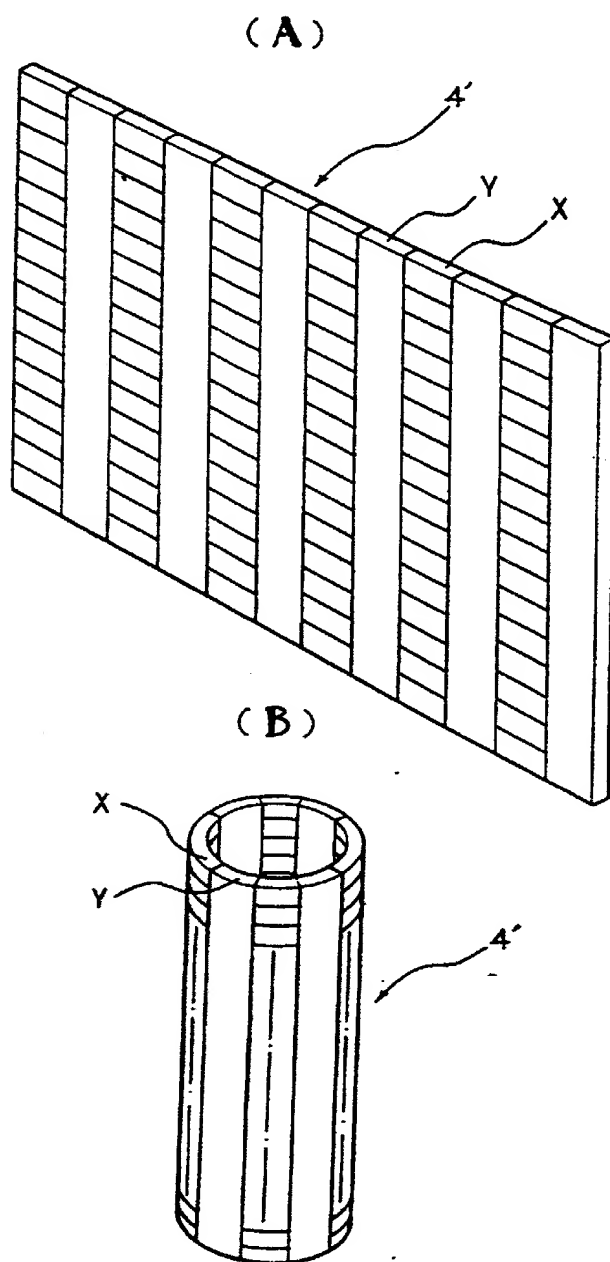


FIG. 6

6/6



## GENERATOR FOR CYCLES

## BACKGROUND OF THE INVENTION

## Field of the Invention

5 The present invention relates, in general, to a generator installed in a motorless cycle such as a bicycle or tricycle and used for supplying electric power for a headlamp of the cycle and, more particularly, to an improvement in such a generator for generating electric power while pushing the pedal and storing surplus electric power in a condenser, thus  
10 turning on the lamp even when the cycle is stopped and thereby being convenient to the user and lengthening the expected life span of the lamp.

## Description of the Prior Art

15 In the prior art, a small-capacity generator for cycles is mounted to the frame of a cycle, with a rotatable cap of the generator being selectively brought into frictional contact with a pneumatic tire of the cycle. The rotatable cap rotates a rotor of the generator thus generating electric power and spreading light over the road while cycling at  
20 night. That is, when a user pedals while bringing the rotatable cap of the generator into contact with the tire, the rotor of the generator is rotated and converts the rotating



force of a wheel into electric power. The electric power is supplied to the headlamp thus spreading light over the road while riding the cycle.

5        However, the above generator is problematic in that it generates electric power only when the user pedals while the rotatable cap of the generator is in frictional contact with the tire. The generator thus causes the user to tire easily through continuous pedaling while cycling at night. When the user slowly pedals, electric power produced by the generator  
10       is less than electric power which is required to power the lamp. In this case, the lamp has a low illumination, preventing the user from adequately seeing the front area of the cycle and thereby sometimes causing an accident while cycling at night.

15       Meanwhile, when the user quickly pedals, the lamp may be overloaded as electric power from the generator exceeds the required power of the lamp. In this case, the expected life span of the lamp is shortened, creating the need for the lamp to be replaced with a new one frequently.

20       Another problem of the above generator resides in that the generator supplies electric power for the lamp only when the user pedals. Therefore, the user has to carry a flashlight, to be used for illuminating the area around the cycle or looking at a map while the cycle is stopped at night.

## SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a generator for cycles in which the above problems can be overcome and which supplies constant current for the headlamp of a cycle while cycling at night, thus allowing the lamp to spread light over the road with a constant illumination and preventing the lamp from being overloaded and thereby lengthening the expected life span of the lamp, and which stores surplus electric power in a condenser and supplies the stored electric power for the lamp thus being convenient to the user for illuminating the area around the cycle or looking at a map when the cycle is stopped.

In order to accomplish the above object, the present invention provides a generator for cycles comprising a generator body set in a hub of a cycle's wheel. In the generator body, a coil stator is fixedly fitted over an axle of the wheel. A cylindrical rotor is attached to the inside wall of a hub frame and is rotatably fitted over the stator with an annular gap being formed between the stator and rotor. The rotor is rotatable relative to the stator thus causing the stator to generate electric power. The generator body also includes a means for transmitting electric power from the stator to the outside of the generator body, means for bearing a rotating motion of the hub frame relative to the axle and a

holding nut retaining the bearing means in its place on the axle thus rotatably holding the hub frame on the axle. The generator further includes a stabilizer, which receives the electric power from the generator body through the electric power transmitting means and applies the electric power to a headlamp of the cycle while stabilizing the electric power. A condenser is connected to the stabilizer and stores surplus electric power and supplies the surplus electric power for the headlamp when the generator body is not operated.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a sectional view showing the construction of a generator for cycles in accordance with an embodiment of the present invention;

Fig. 2 is an exploded perspective view showing the construction of the portion "A" of the generator shown in Fig. 1;

Fig. 3 is a block diagram showing the construction of the generator according to the invention;

Fig. 4 is a sectional view showing the construction of a

generator in accordance with another embodiment of the present invention;

Fig. 5 is an exploded perspective view showing the construction of a generator in accordance with a further embodiment of the present invention; and

Figs. 6a and 6b are perspective views of a movable coiled body used as a rotor of the generator of Fig. 5.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is a sectional view showing the construction of a generator for cycles in accordance with the primary embodiment of the present invention. Fig. 2 is an exploded perspective view showing the construction of the portion "A" of Fig. 1. Fig. 3 is a block diagram showing the construction of the generator according to the invention. As shown in the drawings, the generator 1 of this invention is set in the hub 100 of a cycle's front wheel. In the generator 1, a coil stator 3 is axially mounted to one side of a first insulating disc 10. The above disc 10, which is fixedly fitted over the axle 2 of a wheel, has a plurality of regularly-spaced holes 10a. A first compression coil spring 11 and a first contact terminal 12 are set in each hole 10a of the first insulating disc 10. A cylindrical hub frame 5 is rotatably fitted over the axle 2 with the stator 3 being interposed between the axle

2 and the frame 5. Both ends of the above frame 5 are stepped with an enlarged diameter thus forming opposite bearing seats 6 and 6a and in turn are flanged thus forming spoke holders. Two sets of ball bearings 7 and 7a are set in the bearing seats 6 and 6a and are retained in their places by bossed holding nuts 8 and 9, respectively. The above nuts 8 and 9 are tightly threaded to both ends of the axle 2, respectively. Due to the bearings 7 and 7a, the hub frame 5 is rotatable around the axle 2 with the coil stator 3 being fixed to the axle 2. The second holding nut 9 is fixed to the axle 2 at a position in vicinity to the first insulating disc 10 and has a plurality of axial holes 9b. The generator 1 of this invention also has second and third insulating discs 17 and 18 which are mounted to both sides of the second nut 9. The above discs 17 and 18 have a plurality of axially-extending pipes 17c and 18b on opposite sides thereof. When the discs 17 and 18 are mounted to both sides of the second nut 9, each pipe 17c and an associated pipe 18c are commonly inserted into the same hole 9b of the nut 9 from both sides. Each of the above pipes 17c and 18b is hollow thus forming an axial hole 17d, 18c. A cylindrical permanent magnet 4 is fixed to the inside wall of the hub frame 5 at a position corresponding to the coil stator 3 and is used as a rotor of the generator 1.

The opposite side of the second insulating disc 17 is sectorially recessed thus forming a plurality of sectorial

seats 17a. The generator 1 also includes a plurality of first contact plates 13, 14, 15 and 16, each of which is brought into contact with an associated terminal 12 on one side thereof and has an axial projection 13a, 14a, 15a, 16a on the other side. The above contact plates 13 to 16 are seated in the sectorial seats 17a of the disc 17 with the projections 13a, 14a, 15a and 16a being inserted into the respective holes 17d of the disc 17. A second compression coil spring 19 and a second contact terminal 20 are commonly inserted in each hole 18c of the third insulating disc 18. A fourth insulating disc 21, which has a plurality of recessed sectors 21a on one side thereof, is fitted over the axle 2 at a position outside the third insulating disc 18. A second contact plate 22, having a leading terminal 22a on its outside edge, is seated in each recessed sector 21a of the disc 21. The second contact terminals 20 are brought into contact with the second contact plates 22 of the disc 21, respectively.

The generator 1 further includes a plurality of electric wires 39 extending from the respective leading terminals 22a. One of the above wires 39 extends to a headlamp 27 by way of a fuse box 25 and an on/off switch 26. The other wires 39 are commonly connected to a condenser 24 by way of a stabilizer 23. The condenser 24 in turn is connected to the fuse box 25 through a wire.

In the drawings, the reference numeral 28 denotes a front

wheel fork of the cycle. The numeral 29 denotes a nut which fixes the hub 100 to the front wheel fork 28.

The operational effect of the above generator 1 will be described hereinbelow.

5           In order to assemble the generator 1, the first compression coil springs 11 are inserted into the holes 10a of the first insulating disc 10. Thereafter, the first terminals 12 are inserted into the holes 10a, thus bringing the springs 11 into contact with the stator 3. The first contact plates 10 13 to 16 are seated in the sectorial seats 17a of the second insulating disc 17, with the projections 13a, 14a, 15a and 16a of the plates 13 to 16 being inserted into the respective holes 17d of the disc 17. A second compression coil spring 19 and a second contact terminal 20 are inserted in each hole 18c 15 of the third insulating disc 18. Thereafter, the fourth insulating disc 21 is fitted over the axle 2 at a position outside the third insulating disc 18, with the second contact plates 22 being seated in the recessed sectors 21a of the disc 21 and being brought into contact with the second contact 20 terminals 20, so that the generator 1 is assembled with the hub 100 into a single body.

The above hub 100 is, thereafter, set in the front wheel frame 28 by screwing the nuts 29 to both ends of the axle 2 thus installing the generator 1 on the frame 28.

25           One of the electric wires 39, which extend from the

respective leading terminals 22a of the contact plates 22, is connected to the headlamp 27 by way of the fuse box 25 and the switch 26 as shown in Fig. 3. The other wires 39 are commonly connected to the stabilizer 23 and in turn are connected to the condenser 24. The above condenser 24 is also connected to the fuse box 25 through a wire. In this case, the fuse box 25, stabilizer 23, switch 26 and condenser 24 have appropriate capacities corresponding to both the generator 1 and the headlamp 27 and are arranged at appropriate positions, being free from interfering with the user while cycling.

When the user pedals while cycling, the front and rear wheels are rotated. In the above state, the stator 3 fixed to the axle 2 is stopped while the hub frame 5 is rotated along with the rotor or the permanent magnet 4.

As the rotor or the permanent magnet 4 is rotated with the stator 3 being stopped, the kinetic energy of the rotating front wheel is converted into electric energy by both the stator 3 and rotor 4 thus generating electric power. The electric power is transmitted to the fuse box 25 through the first springs 11, first contact terminals 12, first contact plates 13 to 16 with projections 13a, 14a, 15a and 16a, second springs 19, second contact terminals 20 and second contact plates 22 with leading terminals 22a. The electric power from the leading terminals 22a of the contact plates 22 is also applied to the condenser 24 through the stabilizer 23. When



the switch 26 in the above state is switched on, the electric power is applied to the headlamp 27 thus turning on the lamp 27.

5 The electric power from the generator 1 is partially applied to the lamp 27 in order to turn on the lamp 27, while the surplus power is applied to and stored in the condenser 24.

10 Therefore, it is possible to turn on the headlamp 27 using electric power from the condenser 24 while the cycle is stopped at night, so that the user can see the area around the cycle or look at a map while the cycle is stopped. In the above state, the headlamp 27 is turned on or off by operating the switch 26.

15 The electric power is applied to the lamp 27 by way of the stabilizer 23, so that the lamp 27 sends light over the road with a constant illumination thus allowing the user to effectively see the front area of the cycle and preventing an accident while cycling at night.

20 Fig. 4 is a sectional view showing the construction of a generator in accordance with the second embodiment of the present invention. In the generator 1 according to the second embodiment, most of the elements remain the same as described for the primary embodiment but the bearing means, which rotatably holds the hub frame 5 relative to the axle 2,  
25 comprises two radial ball bearings 37 and 37a. Each of the

above bearings 37 and 37a includes a plurality of balls held between inner and outer races in the conventional manner. One bearing 37a has an axial hole 37b, while a spacer 38a with a hole 38b communicating with the axial hole 37b of the bearing 37a is interposed between the bearing 37a and the front wheel frame 28. The electric wire 39 extending from the stator 3 passes through the holes 37b and 38b thus being led to the outside of the generator 1. The second embodiment effectively reduces the number of elements of the generator 1 and thereby simplifies the assembling process of the generator 1.

In the present invention, the condenser 24 may be removed from the generator 1 thus decreasing the weight of the cycle and reducing the cost of production. In this case, the headlamp 27 is only turned on while the user pedals while cycling. Electric power is supplied to the lamp 27 by way of the stabilizer 23, so that the lamp 27 is always supplied with a constant amount of current and thereby is prevented from being overloaded.

In the generators 1 shown in the drawings, Figs. 1 to 4, the permanent magnet is used as a rotor of the generator, so that the stator fixed to the axle of the front wheel generates direct current. That is, the embodiments of Figs. 1 to 4 provide D.C. generators. However, the present invention may provide an A.C. generator which uses a movable coiled body as a rotor as shown in Figs. 5 and 6.

Fig. 5 is an exploded perspective view showing the construction of an A.C. generator in accordance with the third embodiment of the invention. Figs. 6a and 6b are views of a rotor of the generator of Fig. 5.

5 In the A.C. generator according to the third embodiment, most of the elements remain the same as described for the primary and second embodiments but a movable coiled body is used as the rotor of the generator. That is, a coil stator 3' is fixedly fitted over the axle 2 inside the hub frame 5, 10 while the rotor is mounted inside the frame 5 at a position corresponding to the stator 3'. As shown in Figs. 6a and 6b, the rotor of the generator 1 comprises a movable coiled body 4' which is formed by winding coils Y on a laminated core X, with the coils Y being spaced out at regular intervals. The 15 rotor or the movable coiled body 4' is fitted over the stator 3' with an annular gap being formed between the stator 3' and rotor 4', thus generating alternating current when the rotor 4' is rotated around the stator 3'. The alternating current from the generator is supplied to the headlamp thus turning on 20 the lamp.

As described above, the present invention provides a generator for cycles. The generator is set in the front wheel hub of a cycle, so that electric power is generated by the generator when a user pedals. The electric power is applied 25 to the lamp thus turning on the lamp. The surplus power is

stored in a condenser and is applied to the lamp thus being convenient to the user viewing the area around the cycle or looking at a map with the cycle being at a standstill. The generator of this invention is not brought into frictional contact with the tire different from a typical generator, so that the generator of this invention allows a user to easily pedal. The generator also supplies a constant current for the headlamp through a stabilizer, so that the lamp sends light over the road with a constant illumination without being overloaded. The expected life span of the lamp is thus lengthened.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

WHAT IS CLAIMED IS:

1. A generator for cycles comprising:

a generator body set in a hub of a cycle's wheel, said generator body including:

5 a coil stator fixedly fitted over an axle of the wheel;

a cylindrical rotor attached to the inside wall of a hub frame and rotatably fitted over said stator with an annular gap being formed between the stator and rotor, said rotor being rotatable relative to the stator thus causing the stator to generate electric power;

means for transmitting electric power from the stator to the outside of the generator body;

15 means for bearing a rotating motion of the hub frame relative to the axle; and

a holding nut retaining the bearing means in its place on the axle thus rotatably holding the hub frame on the axle;

20 a stabilizer receiving the electric power from the generator body through the electric power transmitting means and applying the electric power to a headlamp of the cycle while stabilizing the electric power; and

a condenser connected to said stabilizer and adapted for storing surplus electric power and supplying the surplus

electric power for the headlamp when the generator body is not operated.

2. The generator according to claim 1, wherein said rotor comprises a permanent magnet thus causing the stator to generate direct current.

3. The generator according to claim 1, wherein said rotor comprises a movable coiled body formed by winding coils on a laminated core with the coils being spaced out at regular intervals, thus causing the stator to generate alternating current.

4. The generator according to claim 1, further comprising a fuse box and an on/off switch connected between and cooperating with the stabilizer, condenser and headlamp.

5. The generator according to claim 1, wherein said electric power transmitting means comprises:

a first contact terminal received in a first insulating disc and connected to said stator through a first compression spring;

a first contact plate coming into contact with the first contact terminal on one side thereof and having an electric power leading projection on the other side;

a second insulating disc having a hollow pipe and interposed between the first contact plate and the holding nut, with the projection of the first contact plate passing through the pipe of the second insulating disc;

5 an axial hole formed on said holding nut and receiving the pipe of the second insulating disc from one side of the nut;

10 a third insulating disc having a hollow pipe and engaging with the holding nut from the other side of the nut, with the pipe being inserted into the axial hole of the nut from the other side;

15 a second contact terminal received in the pipe of the third insulating disc and brought into contact with the projection of the first contact plate through a second compression spring;

a second contact plate held by a fourth insulating disc and brought into contact with the second contact terminal; and

an electric wire extending from a leading terminal of the second contact plate to the outside of the generator body.

20 6. The generator according to claim 1, wherein said electric power transmitting means comprises:

a radial ball bearing constituting the bearing means, said bearing having an axial hole;

a spacer mounted outside the bearing and having a hole

communicating with the axial hole of the bearing; and  
an electric wire extending from the stator and passing  
through the holes of the bearing and spacer thus being led to  
the outside of the generator body.

- 5           7. The generator according to claim 5 or 6, wherein said  
electric wire is connected to said stabilizer, condenser and  
headlamp.





# The Patent Office

Application No: GB 9704190.9  
Claims searched: 1

Examiner: John Cockitt  
Date of search: 16 April 1997

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.O): H2H [HAJ, HLV3, HLV6]  
Int Cl (Ed.6): B62J [06/06]; H02J [09/04]  
Other: OPTICS [H2A(AK120+AK805)]; ONLINE:WPI,CLAIMS,JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	GB0742198A ALLEC - see figs	1-4,6-7 at least
Y	GB0468065A RALEIGH - see figs	1-4,6-7 at least
Y	EP0591724A1 SCHMIDT - see figs	1-4,6-7 at least
Y	US4191988A KUMAKURA - see figs	3 at least
Y	GB2277371A COOKE - see presence of switch, fuse, stabilizer in cycle lighting arrangement	4 at least
Y	<u>WPI Abstract Accession No 95-236813/31 &amp; JP070144575A (TAKEDA) 06-06-95 (see abstract)</u>	1 at least
Y	<u>WPI Abstract Accession No 94-102397/13 &amp; DE004231436 (FER) 24-03-94 (see abstract)</u>	1-4,6-7 at least
Y	<u>WPI Abstract Accession No 83-D1816K/10 &amp; DE003132005A (ETZBACH) 03-03-83 (see abstract)</u>	1-4,6-7 at least

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X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.